

SEASONAL VARIATIONS in the LIVESTOCK INDUSTRY



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PREFACE

This is the third in a series of bulletins on seasonal variation issued by the Economics Division, Canada Department of Agriculture. The first, by I.S. McArthur, was published in 1942 and titled *Seasonal Variation in Canadian Farm Products*. The second, by F.M. Schrader and G.E. Woollam, was published in 1953, under the title *Seasonal Variation in Prices and Production of Livestock and Livestock Products*.

This bulletin is largely a sequel to the second, but is confined to cattle, calves, sheep, hogs, and their by-products. The purpose is to present and analyze some indexes of seasonal variation of production and prices of the live animals and some of their end-products. Seasonal patterns of storage stocks and retail prices of meat are also studied.

The presentation is both tabular and graphic. The references in the text are primarily to the tables; the charts are to supplement the tables by showing at a glance the general nature of the indexes. The tables and charts may also be used without reference to the text; for this purpose they are paired and each pair is accompanied by a brief descriptive note highlighting the most important points.

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SEASONAL VARIATION IN THE LIVESTOCK INDUSTRY: CATTLE, SHEEP, HOGS, AND CALVES

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Livestock production, like most of agriculture, is influenced by the seasons, which give rise to natural calving, lambing, farrowing, sheering and marketing periods. Production and marketing can, and do, occur outside of these natural periods, but they are usually less economic during the off-seasons since the animals grow and develop under less favorable conditions. Meat consumption also tends to be seasonal, demand for meat being greatest in the winter, and weakest in the summer. Consumption of individual meat products tends to vary more than total meats because of seasonal shifts in demand from one type or cut of meat to another.

This study of seasonality covers the 37-year period 1921 to 1957 inclusive, except where data are not available for the earlier years. During the period studied there were changes in collection methods and quality of the data, and in grade, quality and nature of the products. While the earliest figures are not strictly comparable with the latest, the seasonal pattern may still be comparable over the whole period as it does not necessarily change with data specifications. Changes in production and demand do however bring about real changes in the seasonal pattern and this aspect is treated in the trend section of the study.

Besides seasonal movements, economic time series are subject to trend, cyclic, and irregular movements. The last three are discussed here only as they affect the seasonal movements; they have been removed from the series by methods described in the appendix.

The data for slaughter and storage stocks are for Canada as a whole. The price data are from the Toronto market only; because it is our largest public market and because it serves our largest deficit food-producing area, it sets the seasonal price pattern for all other markets in Canada. Whenever possible, the price series are chosen to represent the bulk of the product marketed; for instance, the price for Good steers was selected to represent movements of cattle prices as a group.

SLAUGHTER, STORAGE STOCKS, AND STOCKYARD PRICES

The purpose of this section is to describe the seasonal patterns of (a) slaughter and prices of cattle, sheep, hogs and calves, and (b) storage holdings of their meat products. Relationships between the patterns are also examined.

Slaughter.—Statistics of slaughter at federally inspected packing plants covering all classes and grades of the animal are used to indicate the seasonality of livestock production, since adequate production data do not exist. Federally inspected slaughter amounts to only 60 to 80 per cent of total production (depending on the class of livestock) but, since non-inspected slaughter and exports of live animals likely follow a similar seasonal pattern, it is believed to be a satisfactory indicator.

Peak slaughter of cattle and sheep occurs in the fall when most of the grass-fed animals are marketed (Table 1). Cattle slaughter is lightest in February but rises to a secondary peak in May when feedlot animals are marketed and slaughtered in greatest numbers. This practice of holding cattle off the market in the fall, feeding them grain throughout the winter and marketing them in the spring, tends to even out the seasonal production pattern. Since fewer sheep than cattle (relative to their total numbers) are finished in feedlots, the index of sheep slaughter is more strongly influenced by the seasonality of grass production.

Although the natural time for calving and farrowing is in the spring, peak slaughter of veal calves and hogs occurs in opposite seasons of the year. Veal calves, largely a by-product of the dairy industry, are marketed six to eight weeks after birth; this accounts for the peak slaughter in May. Slaughter tapers off sharply until August when grass-fed calves begin coming to market. These are largely beef-type calves from western Canada and cannot be described as true vealers.

Hogs require six to eight months to reach market weight so that slaughter normally reaches a peak in November or December (Table 1). However, many farmers, especially in Eastern Canada, obtain two litters per year from each sow. The second litter is usually farrowed in the early fall and slaughtered in the late winter and early spring months, causing a secondary peak in March. Slaughter then tapers off until August.

These differences in seasonal variability among the four classes of livestock may be demonstrated by comparing the ranges of the slaughter indexes (Table 1). The hog index, with a range of 50, is the least variable; it is followed by the cattle index with a range of 56, the calf index with a range of 110, and finally the index for sheep and lambs with a range of 213.

The practice of obtaining two litters a year spreads hog production over the year more evenly than for other stock, but even in hogs peak slaughter is still about 70 per cent higher than the low. Feedlot operations reduce the seasonality

Table 1.— Index of Seasonal Variation in Inspected Slaughter, Canada, 1921–57¹

Month	Cattle	Sheep ²	Hogs	Calves
	(per cent)			
Jan.	95	66	113	51
Feb.	78	50	100	55
Mar.	89	51	108	105
Apr.	88	39	103	156
May	94	32	102	161
June	90	51	91	132
July	90	81	75	111
Aug.	102	128	74	100
Sept.	112	175	82	96
Oct.	127	245	105	93
Nov.	134	194	124	83
Dec.	101	88	123	57
Range from high to low	56	213	50	110

¹1928–57 for calves

²Includes lamb slaughter

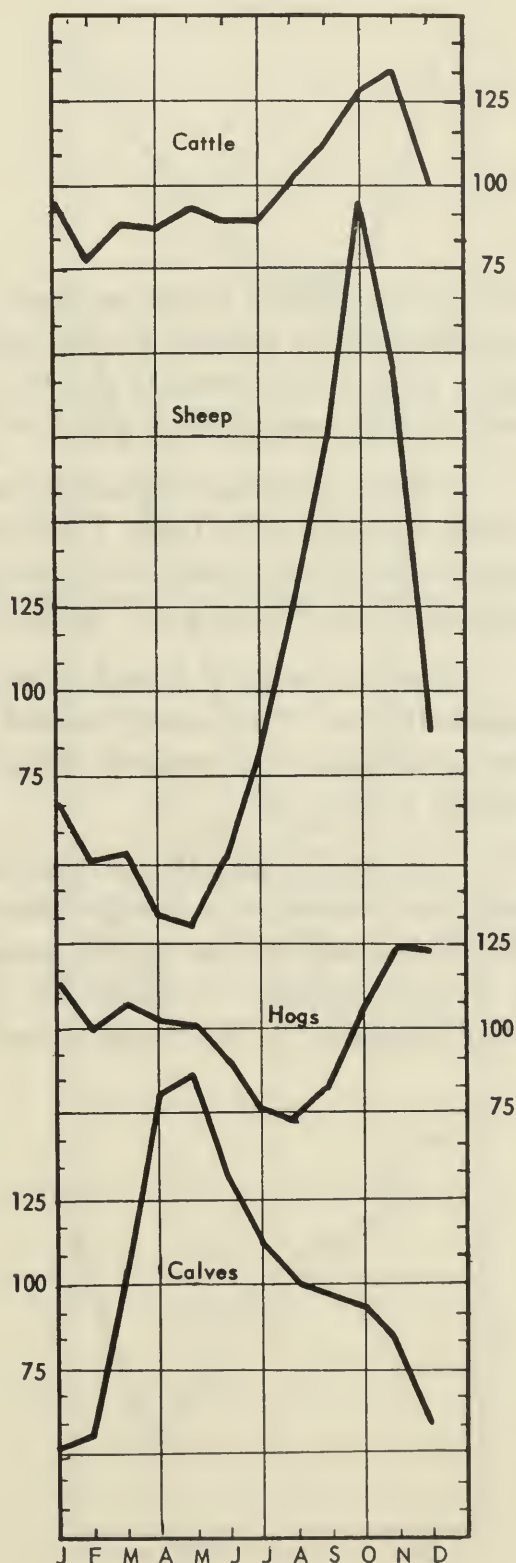
Cattle slaughter is usually heaviest in November, sheep slaughter in October, at the end of the pasture season.

Hog slaughter is also heaviest in November since most sows farrow in the spring.

Calf slaughter is heaviest in May. These are mainly veal calves from the dairy cows of Quebec and Ontario.

The volume of sheep slaughter fluctuates more widely than the other three and has the most pronounced peak.

CHART 1



of cattle production about as much as for hogs, while for calves there is some smoothing of the pattern by the marketing of grass fed calves in the fall. Off-season output of sheep is limited to comparatively few fed lambs and culls, resulting in a seasonal low which is only one seventh of peak production.

Storage stocks.—Seasonal variations in quantities of meat in storage in Canada are shown in Table 2 and Chart 2. The indexes are based on stocks of home-produced beef, pork, veal, mutton and lamb at the first of the month. Fresh, frozen and cured meats are included but canned and imported meats are not.

Meat is usually stored when production is seasonally heavy and prices seasonally low. It is usually moved out of storage and into retail channels when these conditions are reversed. This tends to smooth both prices and consumption over the year.

Pork stocks usually increase during the winter to a peak in May and decline during the summer to a low in October. Stocks of beef and lamb grow during the fall months and decline in the spring. Veal stocks, always comparatively small, are usually smallest in April. All of the indexes tend to change smoothly, indicating regularity in the build-up and disappearance of stocks.

Table 2.— Index of Seasonal Variation in
Storage Stocks, Canada,
1921–57¹

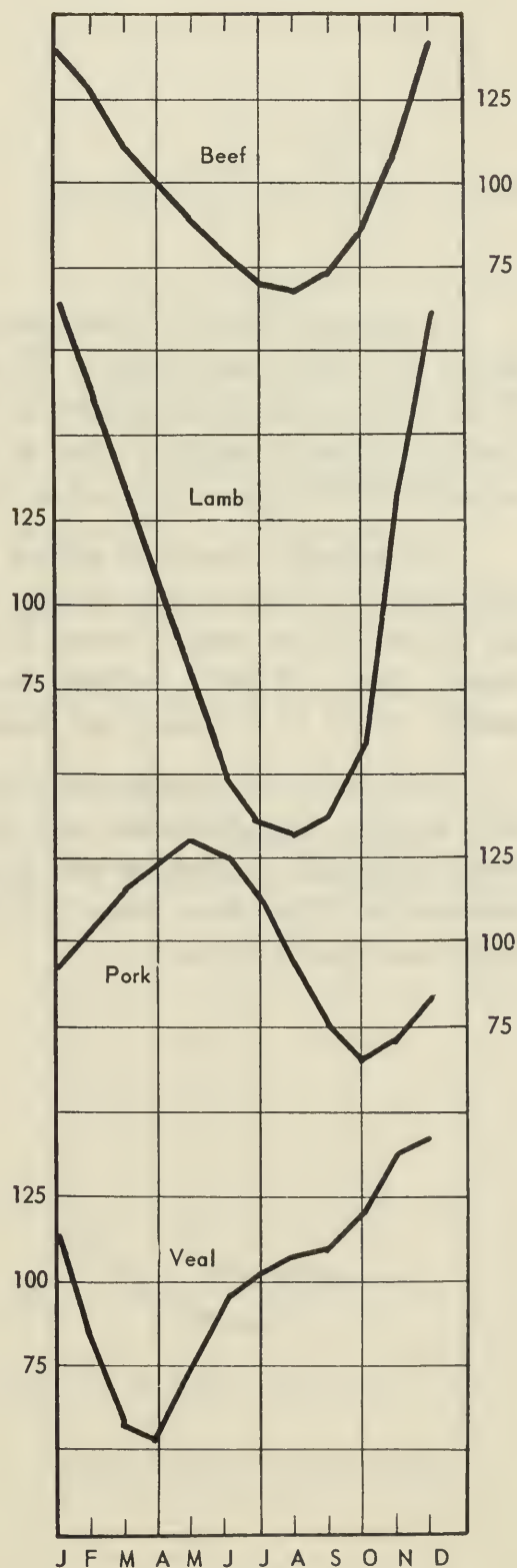
Month	Beef	Lamb ²	Pork	Veal
	(per cent)			
Jan.	139	189	94	115
Feb.	129	163	105	83
Mar.	111	131	117	57
Apr.	100	106	124	54
May	88	77	130	76
June	80	49	126	95
July	71	35	114	103
Aug.	69	32	94	108
Sept.	74	37	75	110
Oct.	86	58	65	120
Nov.	110	135	71	137
Dec.	143	188	85	142
Range from high to low	74	157	65	88

¹1926–57 for veal.

²Includes also stocks of mutton.

Stocks of mutton and lamb fluctuate most, pork least.

CHART 2



Stockyard prices.—Seasonal patterns of changes in livestock prices are shown in Table 3 and Chart 3. These indexes of seasonality are based on prices of the common marketing grades at the Toronto stockyard. Since this is Canada's leading livestock market, price movements there may be considered fairly representative of movements at other Canadian markets.

In general, livestock prices are highest in the summer and lowest in the fall. Steer and lamb prices usually reach their peaks in June, hog prices in July; the lowest prices usually occur in November for steers and hogs, in October for lambs. The calf price pattern, however, is almost the reverse: highest prices usually occur in February and lowest prices in July.

Prices at stockyards are one stage removed from prices at the farm since they include transportation and other charges. Because these charges usually remain constant throughout the year, seasonal patterns of farm prices would be expected to differ from those in Table 3 and Chart 3 by having somewhat higher peaks and deeper lows.

CHART 3

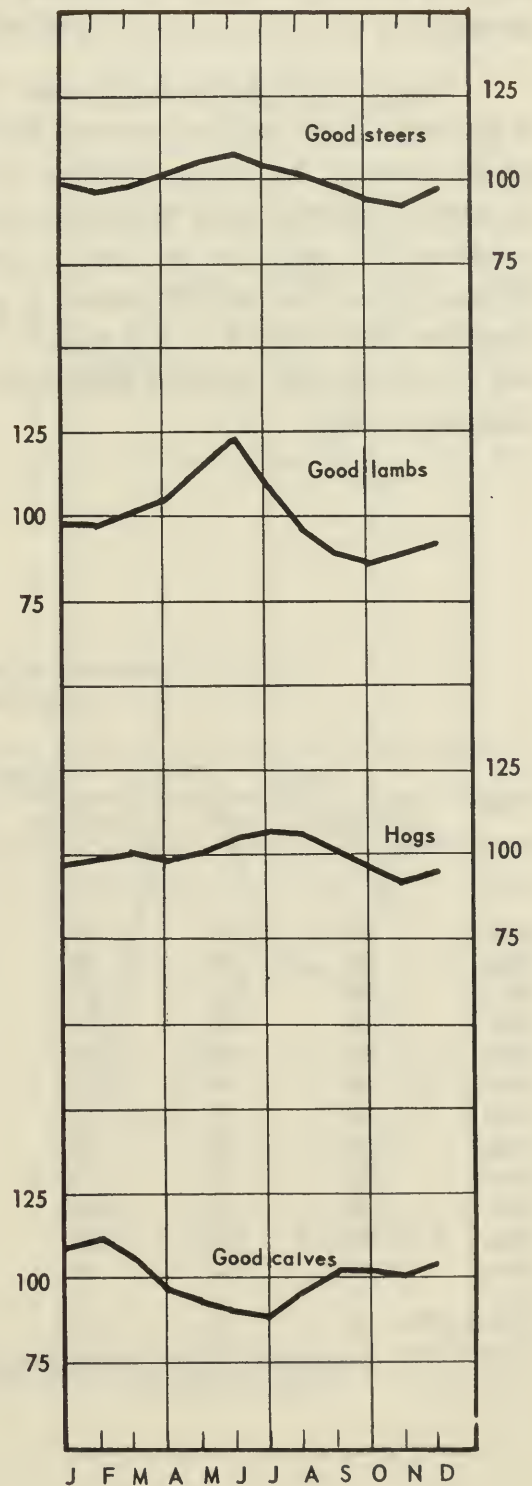
Table 3.— Index of Seasonal Variation in
Stockyard Prices, Toronto,
1921-57

Month	Good steers	Good lambs	Hogs ¹	Good calves
(per cent)				
Jan.	99	99	98	110
Feb.	97	99	99	112
Mar.	99	102	100	105
Apr.	102	106	99	96
May	105	115	100	93
June	108	119	104	90
July	104	109	107	89
Aug.	102	96	106	96
Sept.	99	88	102	102
Oct.	94	86	97	102
Nov.	93	88	93	101
Dec.	98	93	95	104
Range from high to low	15	33	14	23

¹Up to and including 1939, various live grades;
starting in 1940, live weight equivalent of B₁ dressed.

Prices of good slaughter steers, lambs and hogs are usually higher during spring and summer than during fall and winter.

Prices of good and choice calves are usually highest in February, lowest in July.



Relationship between slaughter, stocks and prices.—The slaughter indexes in Table 1 can be arranged in order of increasing variability as (1) hogs, (2) cattle, (3) calves, (4) sheep and lambs when based on their ranges of 50, 56, 110 and 213 respectively. The indexes of stocks and prices in Tables 2 and 3 can be arranged in the same order of variability, suggesting some interdependence.

Chart 4 and Table 4 indicate the relationship between stocks and slaughter. In general stock build up occurs during and after seasonal peaks, best illustrated by the pattern for sheep. Stocks of mutton reach a low in August and a peak in January, 3 months after the same extremes in slaughter. In cattle the relationship is about the same as in sheep, and in hogs it is affected appreciably by fall litters. Thus pork stocks reach a peak in May, two months after the secondary slaughter peak which is due to fall litters, and six months after the primary peak. For calves the lag is even longer, the stock peak occurring seven months after the slaughter peak.

Table 4.— Comparison of Seasonal Indexes of Inspected Slaughter and Storage Holdings

Month	Cattle		Sheep		Hogs		Calves	
	Slaughter	Stocks	Slaughter	Stocks	Slaughter	Stocks	Slaughter	Stocks
(per cent)								
Jan.	95	139	66	189	113	94	51	115
Feb.	78	129	50	163	100	105	55	83
Mar.	89	111	51	131	108	117	105	57
Apr.	88	100	39	106	103	124	156	54
May	94	88	32	77	102	130	161	76
June	90	80	51	49	91	126	132	95
July	90	71	81	35	75	114	111	103
Aug.	102	69	128	32	74	94	100	108
Sept.	112	74	175	37	82	75	96	110
Oct.	127	86	245	58	105	65	93	120
Nov.	134	110	194	135	124	71	83	137
Dec.	101	143	88	188	123	85	57	142
Range from high to low	56	74	213	157	50	65	110	88

CHART 4. - Comparison of the Seasonal Indexes of Inspected Slaughter and Storage Holdings

Slaughter ———
Storage Holdings - - - - -

CHART 4a. - Cattle and Sheep

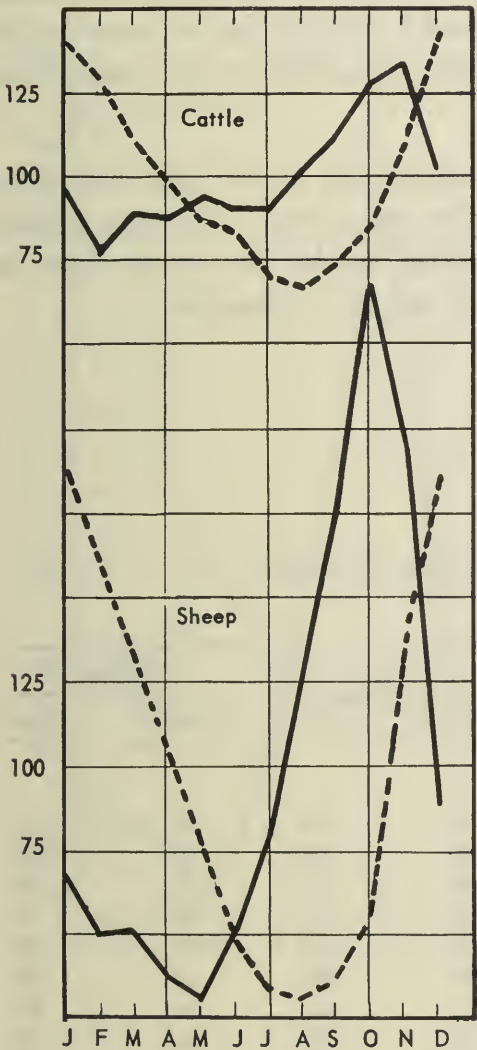
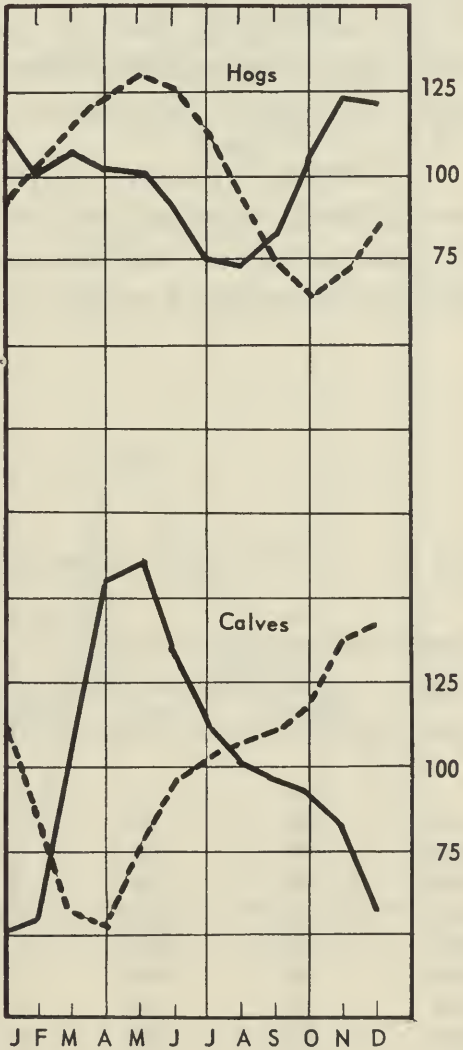


CHART 4b. - Hogs and Calves



In general, stocks of meat are built up during periods of heaviest slaughter, and are reduced when slaughter is seasonally light. Stocks are usually smallest just before seasonal slaughter peaks.

Chart 5 and Table 5 show the relationship between slaughter and stockyard prices. In general the price indexes tend to vary inversely with the slaughter indexes, or simply, prices tend to fall as the slaughter peak is reached. Though the relationship is only rough it can be expected. In the short run supplies that reach the market tend to determine price and the more variable the supply the more variable the price.

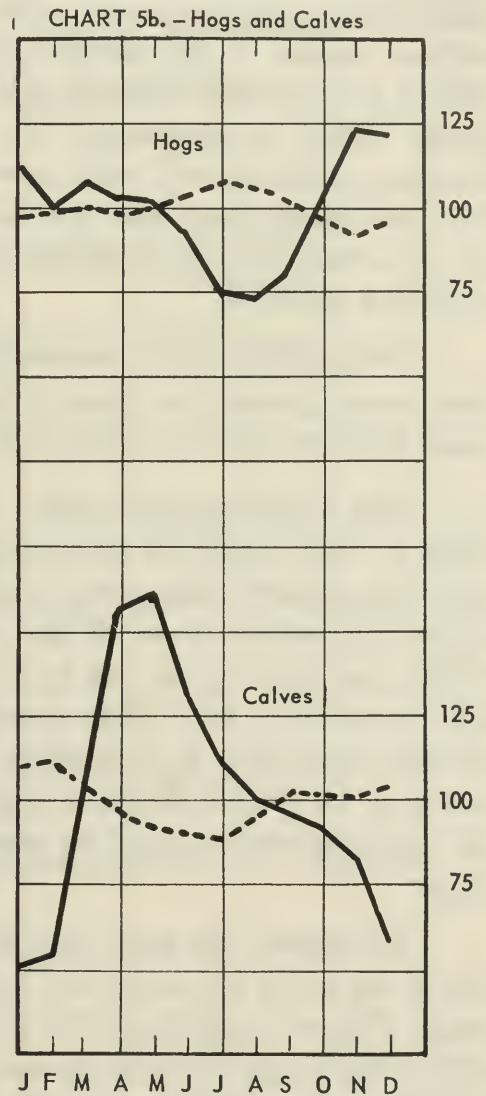
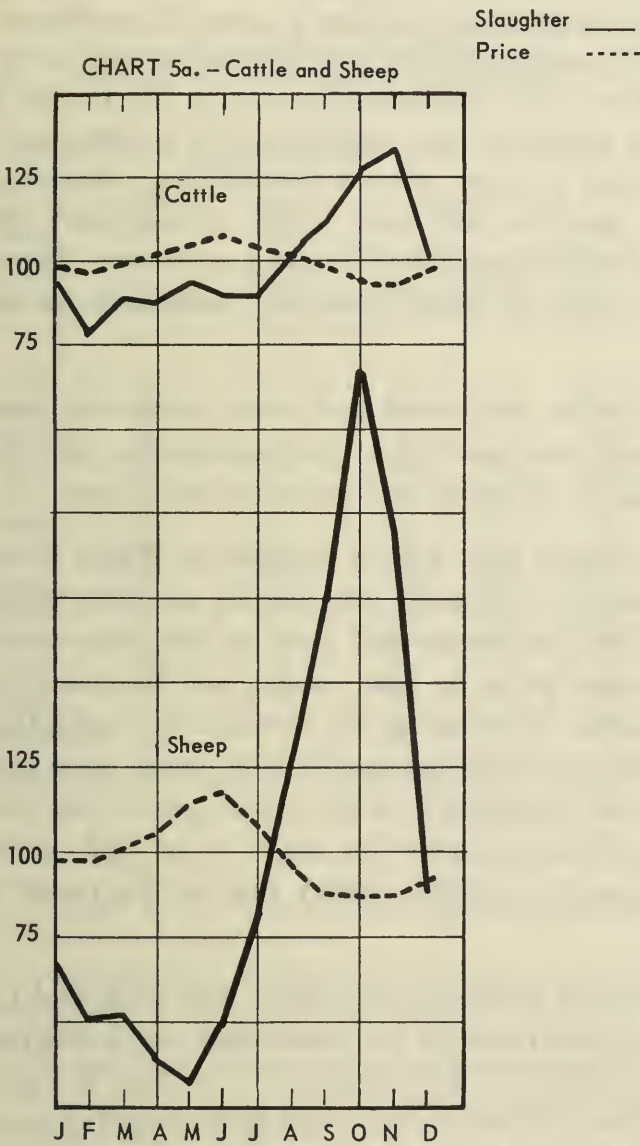
Prices have, however, been more stable than slaughter volume. The main reasons are probably: (1) the presence of storage stocks and exports and imports, (2) the stabilizing effect of consumer demands which is believed to vary in the same way as slaughter volume and (3) the effects of wartime price control and other government stabilization measures.

Seasonal variation in livestock production originates at the farm and gives rise in turn to seasonal patterns in slaughter, stocks and prices. Though mitigated in some ways, the problems associated with variable production at the farm are therefore transmitted to the meat packing and meat storage industries.

Table 5.— Comparison of Seasonal Indexes of Inspected Slaughter and Stockyard Prices

Month	Cattle		Sheep		Hogs		Calves	
	Slaughter	Price	Slaughter	Price	Slaughter	Price	Slaughter	Price
(per cent)								
Jan.	95	99	66	99	113	98	51	110
Feb.	78	97	50	99	100	99	55	112
Mar.	89	99	51	102	108	100	105	105
Apr.	88	102	39	106	103	99	156	96
May	94	105	32	115	102	100	161	93
June	90	108	51	119	91	104	132	90
July	90	104	81	109	75	107	111	89
Aug.	102	102	128	96	74	106	100	96
Sept.	112	99	175	88	82	102	96	102
Oct.	127	94	245	86	105	97	93	102
Nov.	134	93	194	88	124	93	83	101
Dec.	101	98	88	93	123	95	57	104
Range from high to low	56	15	213	33	50	14	110	23

CHART 5. - Comparison of Seasonal Indexes of Inspected Slaughter and Stockyard Prices



When slaughter is seasonally heavy, prices are seasonally low. However, prices are more stable than slaughter volume, and lowest prices do not always occur at the same time as slaughter peaks. Storage movements and international trade are two important stabilizing influences.

STOCKYARD, WHOLESALE AND RETAIL PRICES

This section compares seasonal price patterns at various stages in the marketing channel. The stockyard price used here represents the price paid by packers and other buyers for live animals delivered to the Toronto Union Stockyards. This price is one stage removed from the farm but it represents one of the earliest stages in the marketing process. The wholesale price is the packer's selling price of the dressed animal to butchers and retailers; this represents a middle stage in marketing. The packer's price allows for killing, skinning, dressing, storing, and other services that he performs. Retail prices mark the final marketing stage and are the prices that retailers charge consumers. These prices cover various retailing costs and all other services performed in the marketing process.

For cattle, the comparison includes one stockyard, one wholesale, and three retail prices; for hogs it includes one stockyard, two wholesale, and two retail prices; and for calves and lambs it includes one price at each level.

The comparison for cattle and various beef prices appears in Table 6 and Chart 6. The stockyard and wholesale price indexes are similar as their peaks and lows occur in the same months. But the peaks and lows of the three retail prices lag behind those of the wholesale price by one month, and the peaks in sirloin and round steak lag by two months. Comparing the indexes for variability and considering only blade roast, a low- to medium-quality cut, there is a progressive reduction in variability from the stockyard to the retail price. But this is not so for sirloin steak, a high-priced cut, because its range is as high as for the wholesale price, and for round steak, a medium-quality cut, as its range is higher.

For sheep the time lag is about the same as for cattle; the peak and the low in the retail price lag one month behind those of the wholesale and stockyard prices (Table 7 and Chart 7). However, there is no progressive decline in variability. The range of 15 in the retail index is the lowest of the three, but the range for the wholesale index is higher than for the stockyard price.

For hogs there are two wholesale prices: one for packer hogs or whole hog carcass, and the other for smoked bacon which is for only a part of the carcass (Table 8 and Chart 8). The packer hog price represented only a small volume of sales after 1938, as cuts were gradually replacing carcasses in the wholesale trade, and in 1955 this price series was discontinued. Since no better data was available and because the volume of sales does not necessarily affect the seasonal pattern, this series was accepted as a useful indicator of seasonal changes during the period 1921-54. In general the comparison for hogs gives about the same results as for cattle and beef. The peaks and lows at the retail level, now including the wholesale price of bacon, lag behind those of the carcass and

Table 6.— Comparison of the Seasonal Index of the Stockyard Price of Cattle in Table 3 with the Wholesale and Retail Prices for Beef, Toronto, 1921–57

Month	Stockyard price good steers	Wholesale	Retail Price		
		price good steer carcass	Sirloin steak	Round steak	Blade roast
		(per cent)			
Jan.	99	99	98	98	100
Feb.	97	97	98	99	101
Mar.	99	98	97	97	99
Apr.	102	100	98	98	100
May	105	102	100	100	100
June	108	105	102	103	101
July	104	105	105	105	103
Aug.	102	102	105	106	102
Sept.	99	101	103	103	100
Oct.	94	97	101	100	100
Nov.	93	96	97	96	97
Dec.	98	98	96	95	97
Range from high to low	15	9	9	11	6

Prices of live steers are more variable than either wholesale or retail prices of beef.

Retail prices of beef cuts, however, seem to be no more stable than wholesale prices of beef carcass. Prices of blade roast are less variable, sirloin steak about the same, and round steak more variable than wholesale carcass prices.

Retail price changes tend to lag behind wholesale price changes by one to two months.

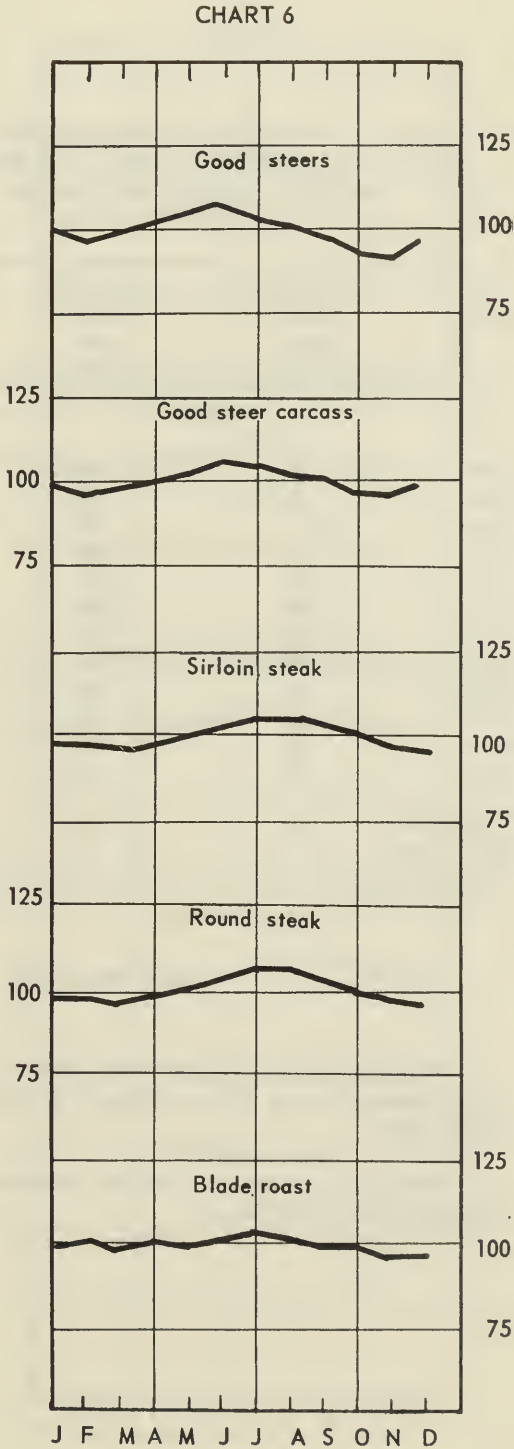


Table 7.— Comparison of the Seasonal Index of the Stockyard Price of Lambs in Table 3 with Wholesale and Retail Prices for Lamb, Toronto 1921–57

Month	Stockyard price good lambs	Wholesale price good carcass ¹	Retail price lamb leg roast
(per cent)			
Jan.	99	97	98
Feb.	99	96	100
Mar.	102	99	100
Apr.	106	105	101
May	115	110	102
June	119	122	104
July	109	115	107
Aug.	96	102	107
Sept.	88	90	101
Oct.	86	86	95
Nov.	88	86	92
Dec.	93	92	93
Range from high to low	33	36	15

¹ 1924–57 only.

Retail prices of lamb (leg roast) are more stable than either wholesale prices of lamb carcasses or stockyard prices of live lambs.

Retail price changes lag behind wholesale and stockyard prices by one month.

CHART 7

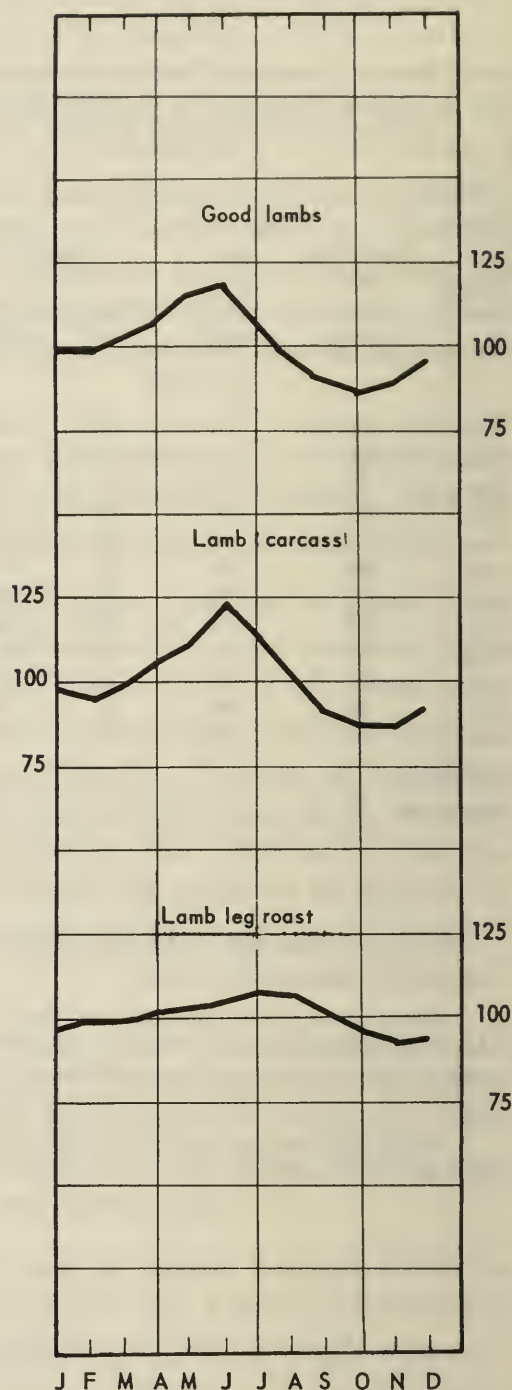


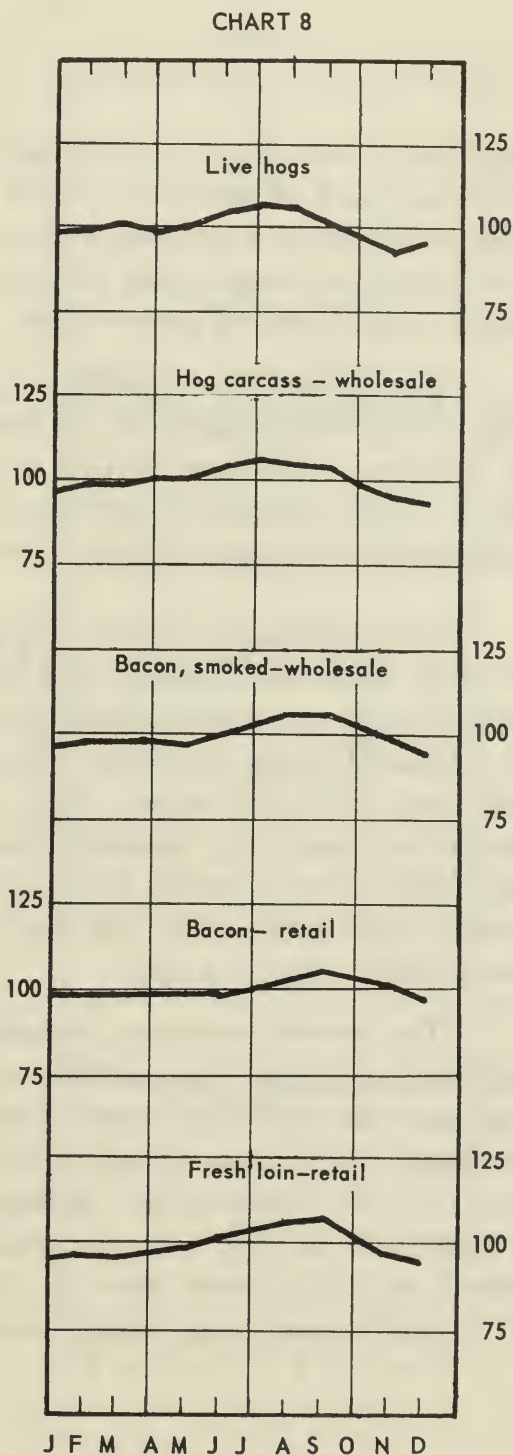
Table 8.— Comparison of the Seasonal Index of the Stockyard Price of Live Hogs in Table 3 with the Wholesale and Retail Prices for Pork, Toronto, 1921-57

Month	Stockyard	Wholesale		Retail	
	price	price		price	
	live hogs	Hog ¹ carcass	Bacon smoked	Bacon	Fresh loin
(per cent)					
Jan.	98	97	96	98	96
Feb.	99	99	97	98	97
Mar.	100	99	98	98	96
Apr.	99	100	98	98	97
May	100	100	97	98	98
June	104	103	100	98	101
July	107	106	103	100	104
Aug.	106	105	106	102	107
Sept.	102	104	106	105	108
Oct.	97	98	103	104	103
Nov.	93	95	100	102	98
Dec.	95	94	96	99	95
Range from high to low	14	12	10	7	13

¹1921-54 only. Shop hogs to 1939, packer hogs thereafter.

Retail price changes tend to lag behind changes in wholesale and stockyard prices. Also, changes in wholesale prices of smoked bacon lag behind prices of live hogs.

Bacon prices fluctuate less at retail than at wholesale, and both are more stable than prices of live hogs. Prices of fresh loin, however, are not appreciably more stable than prices of live hogs.



stockyard prices from one to several months. Comparing indexes and considering the retail price of bacon only, there is a progressive gradual decline in the ranges from stockyard to consumer prices. As in beef, however, this is not true for all retail cuts; the range of the price for fresh loin is 13 and is higher than the range of 12 for the price of packer hogs.

For calves the comparison is made in Table 9 and Chart 9. There are no lags, the peaks and lows for all three prices occurring in the same months. There is, however, a definite decline in variability; the range for stockyard prices is 23, for veal carcass 17 and for veal front roll 9. Since only one retail cut is considered, the same condition cannot be assumed for all cuts.

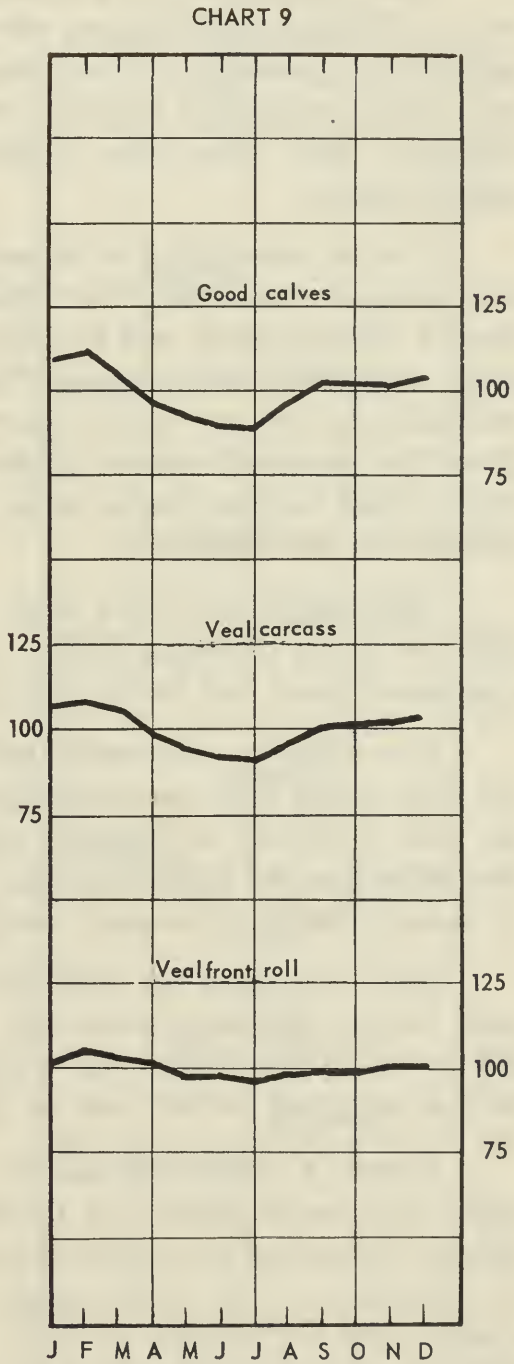
It is not easy to arrive at general conclusions from this analysis because the data were not adequate and not all retail cuts could be considered. There appear to be two tendencies, however. The first and most persistent one is for the seasonal peaks and lows in retail prices to lag behind corresponding wholesale and stockyard prices. This would be expected: assuming that consumer demand remains fairly constant, most retailers will start charging different prices only after existing stocks are gone and they have to pay different prices for new stocks. This takes some time and will depend on the volume of stocks retailers and packers usually carry.

The second tendency, though somewhat less certain, is for the seasonal indexes to become less variable at the consumer end. In general this would be expected: the marketing margin tends to remain fixed throughout the year and the stockyard price forms a continually decreasing proportion of the total consumer price. In the analysis the tendency for a progressive reduction in variability occurred, (1) in beef when the retail price was for blade roast, a relatively low-priced cut, (2) in pork when the cut was bacon which is widely consumed, and (3) in calves and veal, where none of these conditions could be said to apply.

Table 9.— Comparison of the Seasonal Index of the Stockyard Price of Veal Calves in Table 3 with the Wholesale and Retail Prices for Veal, Toronto, 1921-57

Month	Stockyard price good calves	Wholesale price veal carcass	Retail price veal front roll
	(per cent)		
Jan.	110	108	102
Feb.	112	109	105
Mar.	105	106	104
Apr.	96	98	101
May	93	94	98
June	90	92	98
July	89	91	96
Aug.	96	95	98
Sept.	102	100	99
Oct.	102	102	99
Nov.	101	102	100
Dec.	104	103	100
Range from high to low	23	18	9

Changes in retail and wholesale prices of veal do not lag behind changes in prices of live calves. There is, however, a marked decline in variability between stockyard and retail price levels.



LIVESTOCK BY-PRODUCTS

The purpose of this section is to describe the seasonal price pattern for wool, calfskins, cattle hides, sheepskins, and lard. Except for lard, these by-products are generally the raw materials for further production. Hides and skins are usually cured after skinning and sold by packers and farmers to tanners and exporters. Wool, after some preliminary processing, is sold to yarn and textile manufacturers.

For the description of seasonal patterns, the prices of the by-products are less adequate than the other prices used in this study, chiefly because they cover a shorter period, and because they have been subject to greater changes in grade and price specifications. They are used here because nothing better is available, and because it is believed that changes in specifications do not always affect the seasonal pattern appreciably. The indexes are based on wholesale prices; there is also a retail price for lard. The six indexes are brought together in Table 10 and Chart 10.

The wool index with a range of four is the most stable and appears also to have two peaks and lows. There is a peak in February and a low in October and a secondary peak and low in July and May respectively.

For calfskins and cattle hides, the indexes tend to be low in the spring and high in the fall; for sheepskins the seasonal pattern is almost the reverse, the peak occurring in February and the low in July. The seasonal pattern for sheepskin has the highest range, a characteristic also common with the ranges in sheep slaughter, storage stocks of lamb, and stockyard prices for lambs.

The two prices for lard show similar though not identical patterns. The index for the wholesale price has a low in May and a high in October. The peak and low in its retail price, as in other retail prices, tend to lag by a month or so, the low occurring in July and the peak in November.

Canada's import and export trade in wool, hides and skins is large compared with her production of these commodities and as a result her prices are strongly influenced by world markets. These in turn are affected by the seasonality of production in the main export countries in the southern hemisphere whose seasons are the reverse of ours. This in the main is why Canada's wool and hide prices as shown here, do not appear to be affected by her production. Foreign trade in lard is not as important, and domestic demand which tends to be strong in the winter and low in the summer likely determines its price seasonality.

Table 10.— Indexes of Seasonal Variation of
Wholesale and Retail Prices for Livestock
By-products, Toronto¹
Various Periods²

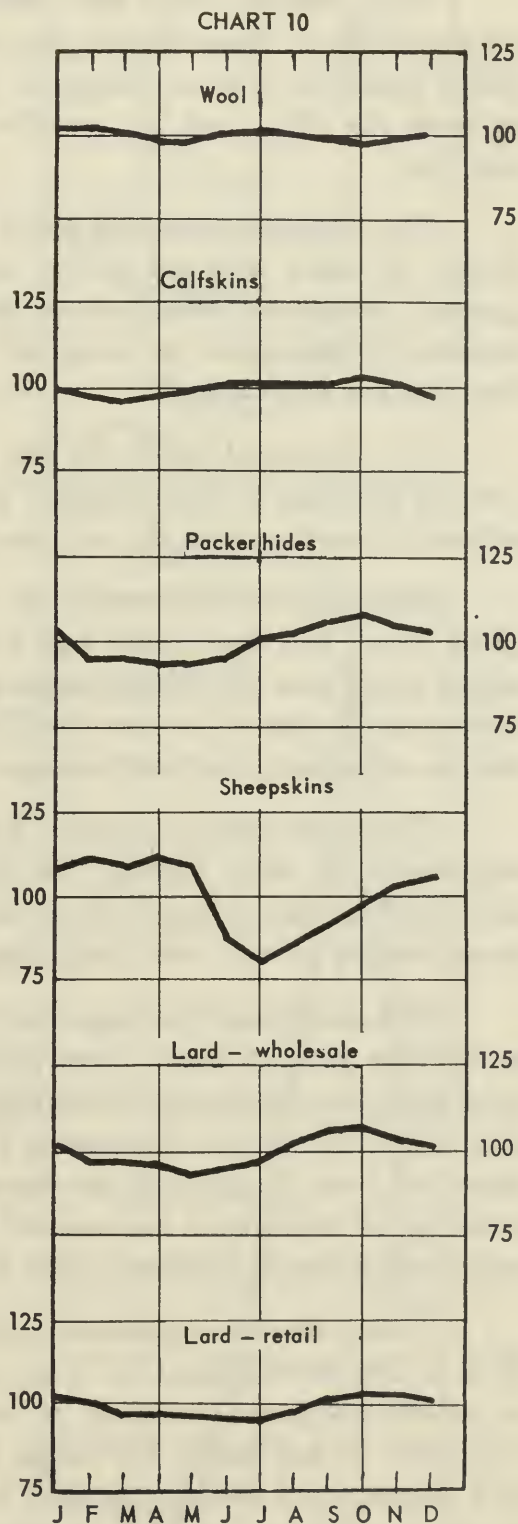
Month	Wool east. dom.	Calfskins city cured	Packer		Sheepskins shorn pickled	Lard	
			hides native steers			Wholesale	Retail
(per cent)							
Jan.	102	100	103		108	101	102
Feb.	102	98	95		112	98	101
Mar.	101	97	95		109	98	99
Apr.	99	98	94		110	97	98
May	99	99	94		109	94	97
June	100	101	95		88	95	96
July	101	101	101		80	96	96
Aug.	100	101	102		86	102	98
Sept.	99	101	106		91	106	102
Oct.	98	103	107		98	107	104
Nov.	99	102	105		103	104	104
Dec.	100	99	103		106	102	103
Range from high to low	4	6	13		32	13	8

¹ Calfskins are f.o.b. shipping points. Packer hides are delivered eastern points.

² 1923–57 for wool, 1927–57 for packer hides, 1932–56 for sheepskins and 1921–57 for the others.

Prices of wool and calfskins are seasonally stable; packer hides and sheepskins are much less so.

Lard prices, which are not highly variable, tend to be more stable at retail than at wholesale. Also, retail price changes lag behind changes at wholesale by one to two months.



TRENDS IN SEASONAL PATTERNS

This section deals with trends, or changes, in the seasonal pattern over long periods of time. Trends can arise from a shift of the peak or low to a different month, or from a change in the range, which is the difference in the index between the peak and low months. These trends can occur either separately or together.

The method of showing trend is to compare the seasonal pattern in the most recent 10 years with the period in the earliest 10 years. The method shows the general nature of overall trend and is simple to calculate and present. It is, however, insensitive to localized or short-term trends, and where these occur they cannot be isolated.

The seasonal index for the last 10 years may also be used to show the current position of the seasonal pattern. This is useful whenever there is considerable trend as then the average pattern may differ greatly from the current one.

Slaughter.—The trends in cattle slaughter are shown in Table 11 and Chart 11a. The main trend was a reduction of the range from 78 to 39. An additional trend was the disappearance of the single secondary peak in May. These trends may be traced to more feedlot feeding, lengthening of the “feeding” period and to a tendency to feed younger cattle than before.

The main trend for sheep (Table 11 and Chart 11b) was also a reduction in amplitude, the range falling from 258 to 206. Another trend was a shift of the low from April to May; along with it, there was some increase in slaughter in the first three months of the year, indicating more feedlot feeding.

The major trend for hogs was the occurrence of a more pronounced secondary production peak in March, from fall litters (Table 12 and Chart 12a). At the same time the low deepened, and shifted from July to August increasing the range from 47 to 52, or by 10 percent. Production has therefore become more variable over the year in spite of the increased output of fall litters. The latter are increasing in importance because of improved housing, improved feeding practices, and greater specialization in hog production.

There are two important trends for calves (Table 12 and Chart 12b). The first is the development of a secondary slaughter peak in September, which can be attributed to the increase in slaughter of grass-fed calves. The second is a reduction in amplitude, the range falling from 116 to 102. In common with cattle and sheep, calf production also has become more evenly spread over the year. A third and lesser trend is a change in the seasonal extremes. The peak month shifted from May to April, and the low from December to February. The last two trends can be attributed to better housing, feeding and management of cattle, and more even milk production in all seasons. This has resulted in earlier calving and calving in more months of the year.

Table 11.— Trend in the Seasonal Indexes of Slaughter for Cattle and Sheep 1921–30 and 1948–57

Month	Cattle		Sheep	
	1921–30	1948–57	1921–30	1948–57
	(per cent)			
Jan.	83	99	54	67
Feb.	65	83	34	53
Mar.	84	94	32	53
Apr.	92	85	27	36
May	101	93	28	26
June	88	102	47	38
July	88	94	80	67
Aug.	103	98	128	128
Sept.	111	119	180	208
Oct.	138	114	285	232
Nov.	143	122	218	200
Dec.	104	97	87	92
Range from high to low	78	39	258	206

Slaughter of both cattle and sheep was much less seasonal in the 1950's than in the 1920's.

The spring peak in cattle slaughter which characterized the 1920's had disappeared by the 1950's, and the fall peak became less pronounced.

Sheep slaughter became less heavily concentrated in October and November, but grew seasonally heavier in September, during the winter and in the early spring.

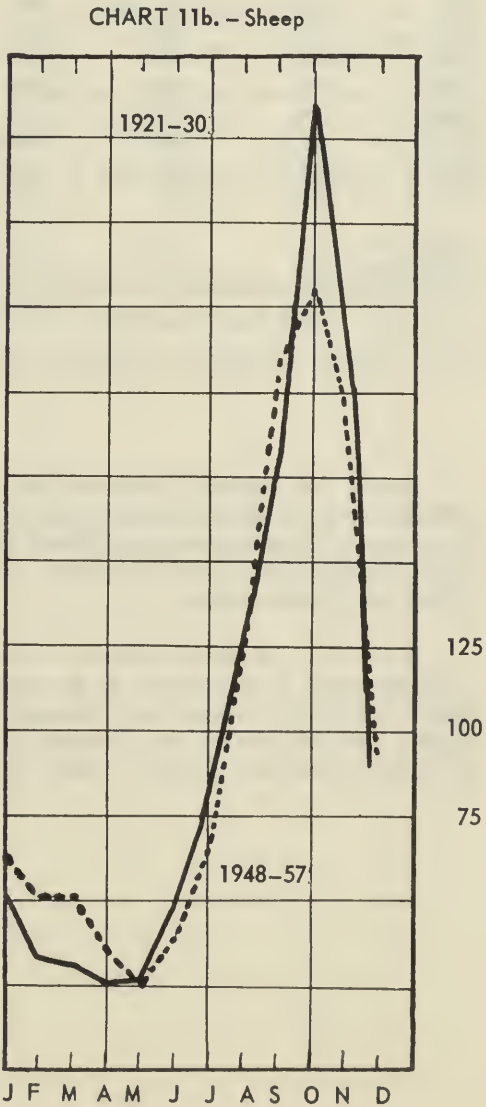
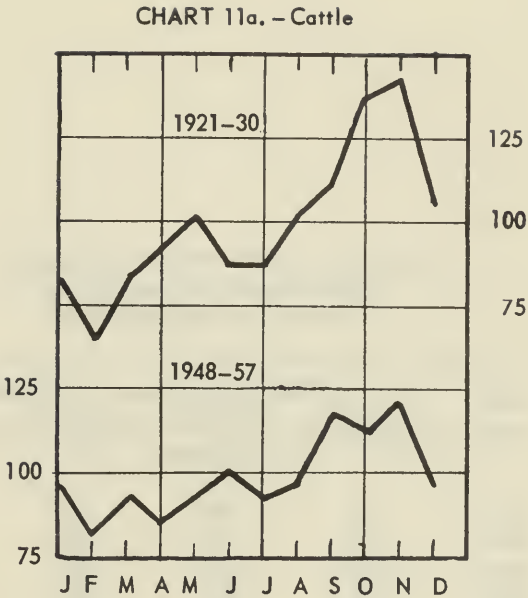


Table 12.— Trend in the Seasonal Indexes of Slaughter for Hogs and Calves, Earliest 10 years and 1948–57

Month	Hogs		Calves	
	1921–30	1948–57	1928–37	1948–57
	(per cent)			
Jan.	120	106	52	53
Feb.	103	97	59	53
Mar.	106	114	105	106
Apr.	100	103	153	155
May	100	100	167	153
June	94	95	136	130
July	76	75	115	102
Aug.	76	72	102	96
Sept.	81	89	95	105
Oct.	101	104	93	94
Nov.	120	121	72	89
Dec.	123	124	51	64
Range from high to low	47	52	116	102

Hogs.— The important trend was the development, by 1948–57, of a secondary slaughter peak in March owing to an increase in the proportion of fall litters. Slaughter became slightly more seasonal and the period of lightest slaughter shifted from July to August.

Calves.— A secondary slaughter peak developed in September owing to an increase in the proportion of 'grass calves'. Slaughter became less seasonal, the period of lowest slaughter shifted from December to February, and the period of heaviest slaughter shifted from May to April.

CHART 12a. — Hogs

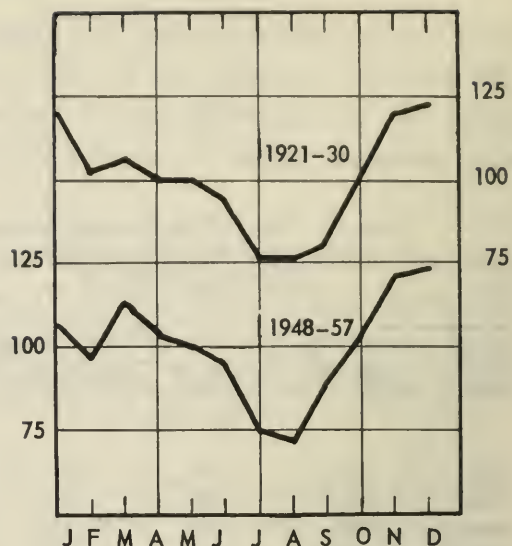
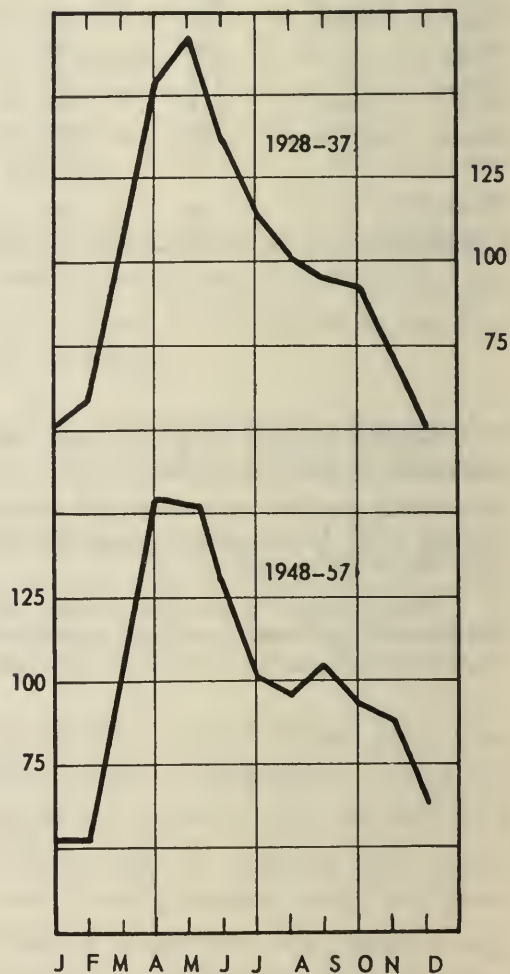



CHART 12b. — Calves





Storage stocks.—Storage stocks tend to have the same trends in their ranges as the slaughter indexes, (Tables 13 and 14 and Charts 13 and 14). The ranges for beef and lamb declined substantially (Table 13); for veal the decline was more modest; and for pork the range increased (Table 14). The ranges for the slaughter indexes changed (Tables 11 and 12) in the same direction though not necessarily in the same degree.

Storage stocks also show some trends in seasonal extremes. Similar trends are found in the slaughter indexes, but it is difficult to relate the two. They can be more readily explained by developments in the storage industry itself, or by changes in consumer habits.




Table 13.— Trends in the Seasonal Index of the
Stock Holdings of Beef and Lamb from
1921-30 to 1948-57

Month	Beef		Lamb	
	1921-30	1948-57	1921-30	1948-57
	(per cent)			
Jan.	161	118	195	169
Feb.	138	120	176	151
Mar.	115	108	145	124
Apr.	100	102	119	102
May	82	96	83	83
June	72	91	51	60
July	61	84	31	48
Aug.	58	83	25	42
Sept.	66	83	24	50
Oct.	78	92	38	73
Nov.	112	101	123	126
Dec.	157	122	190	172
Range from high to low	103	39	171	130

Storage holdings of both beef and mutton and lamb were less variable in the 1950's than in the 1920's. This is in line with the decline in seasonality of slaughter.

CHART 13a. - Beef

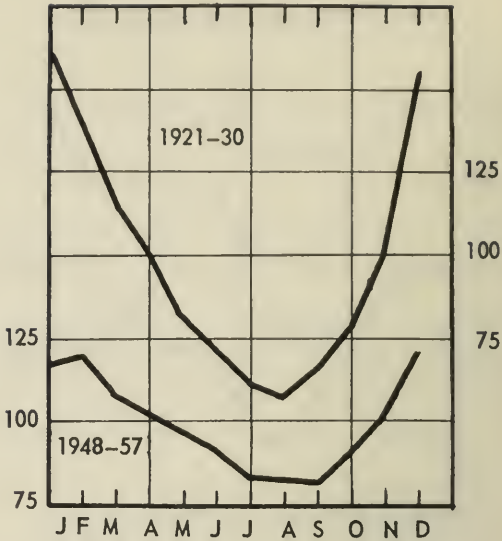


CHART 13b. - Lamb

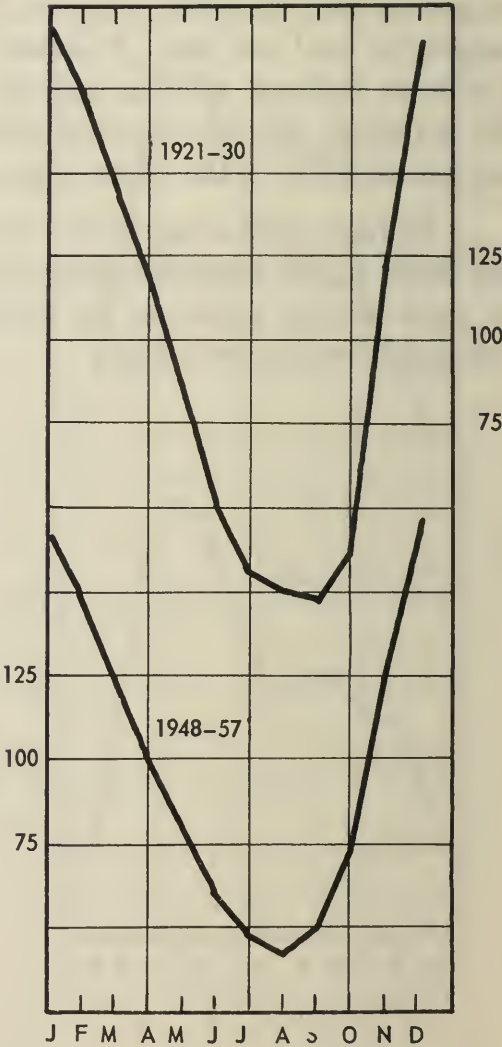


Table 14.— Trend in the Seasonal Indexes of the Stock Holdings of Pork and Veal, Earliest 10 years and 1948–57

Month	Pork		Veal	
	1921–30	1948–57	1926–35	1948–57
	(per cent)			
Jan.	86	89	127	107
Feb.	105	99	89	83
Mar.	118	114	64	58
Apr.	126	124	60	53
May	131	134	75	80
June	127	133	90	99
July	116	124	95	107
Aug.	100	98	100	110
Sept.	83	73	101	112
Oct.	69	60	114	122
Nov.	64	68	139	134
Dec.	75	84	146	135
Range from high to low	67	74	86	82

Storage holdings of pork and veal were seasonally more variable during 1948–57 than during the 1920's. These are in line with changes in hog and calf slaughter patterns.

During the 1920's, storage holdings of pork were usually lowest in November; by 1948–57, the low point had shifted to October. Holdings were usually highest in May, during both periods.

Veal holdings were usually largest in December and smallest in April, during both periods.

CHART 14a. — Pork

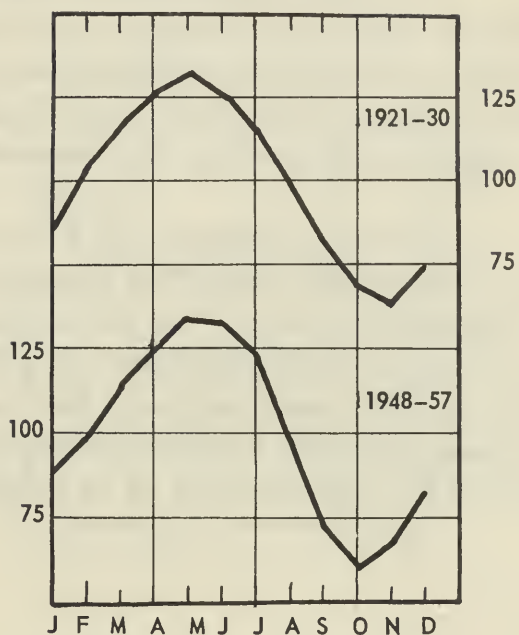
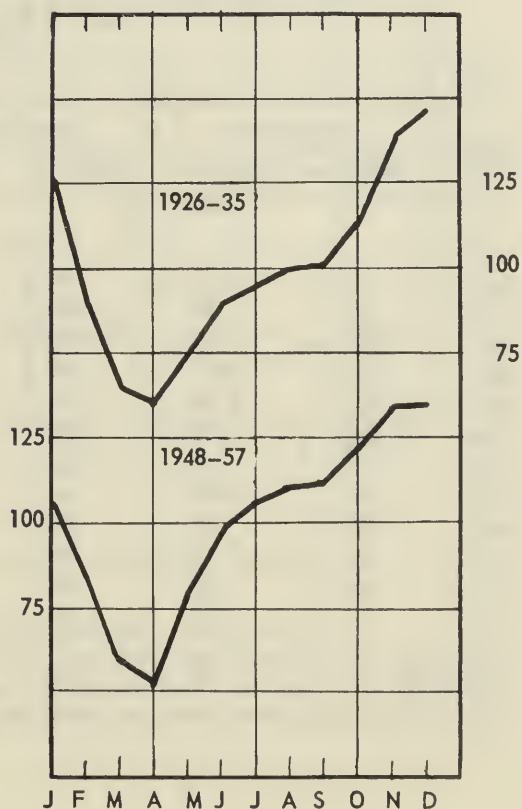


CHART 14b. — Veal



Stockyard prices.—The main trend was a reduction in amplitude, shown by the noticeable reduction in the ranges (Table 15 and Charts 15a to 15d). This may be attributed to corresponding declines in the variability of slaughter. Since hog slaughter has grown more variable, other factors such as government price support programs may be responsible for the greater stability in recent years.

Another important trend was the change in seasonal extremes for steers and calves. For steers the peak price moved from May to August and the low from November to March. For calves the low month changed from April to July, and since the seasonal extremes for calf slaughter also changed, the two events may be at least partly related. The seasonal extremes for cattle slaughter did not change, however (Table 11). The cause for this trend in steer prices appears to lie in the consumer end as is suggested below (page 32).

Table 15.— Trends in the Seasonal Indexes of Stockyard Prices,
1921–30 to 1948–57

Month	Good steers		Good lambs		Hogs		Good calves	
	1921–30	1948–57	1921–30	1948–57	1921–30	1948–57	1921–30	1948–57
(per cent)								
Jan.	99	100	100	100	97	98	113	109
Feb.	98	96	102	99	100	99	114	112
Mar.	102	95	106	100	102	98	104	107
Apr.	106	97	108	103	102	95	86	100
May	110	99	116	110	100	100	86	97
June	110	103	122	116	101	106	87	94
July	104	104	108	110	105	107	89	89
Aug.	99	105	94	100	110	106	99	93
Sept.	96	103	86	92	103	102	107	97
Oct.	90	98	83	87	97	97	107	99
Nov.	88	99	85	89	91	95	102	100
Dec.	98	101	90	94	92	97	106	103
Range from high to low	22	10	39	29	19	12	28	23

CHART 15. - Trends in the Seasonal Indexes of Stockyard Prices

CHART 15a. - Good Steers

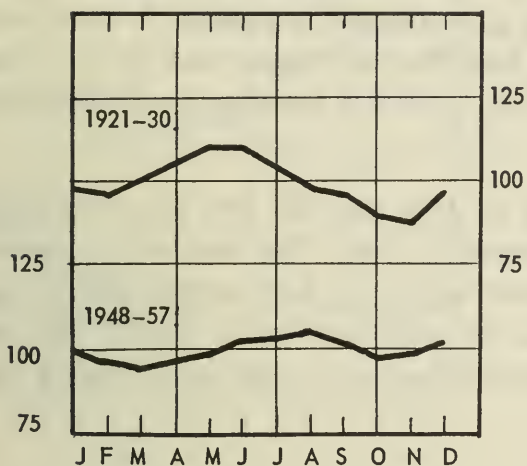


CHART 15c. - Hogs

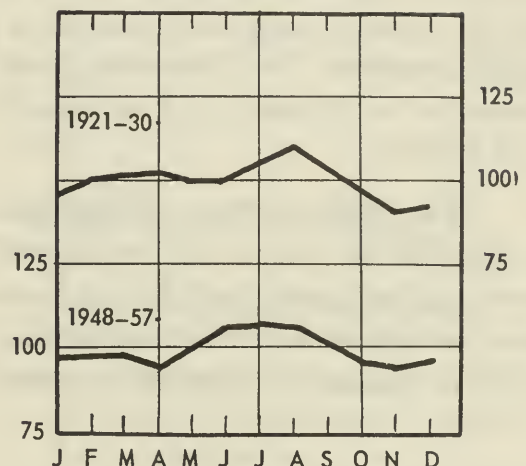


CHART 15b. - Good Lambs

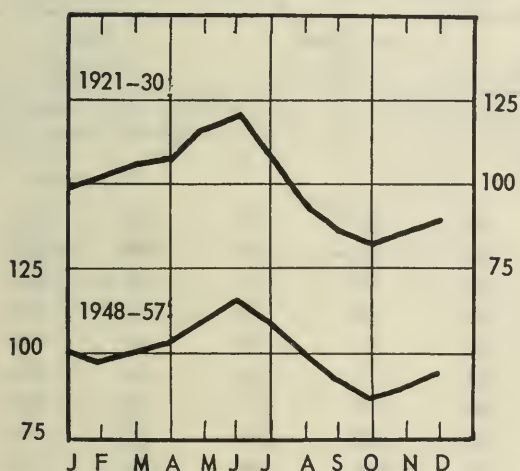
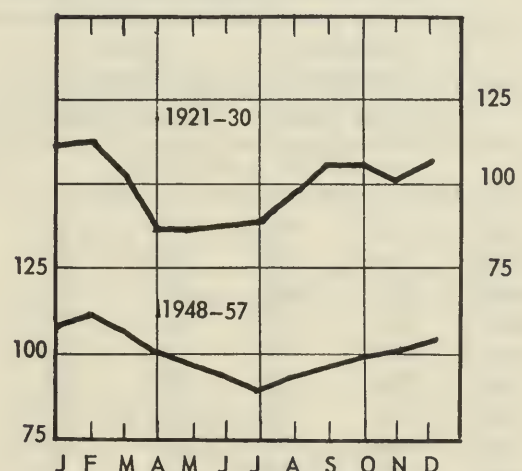


CHART 15d. - Good Calves



Prices of all four classes of livestock showed less seasonal variation during 1948-57 than during the 1920's.

There were also changes in timing of seasonal extremes. Peak prices of good steers shifted from May to August, lowest prices from November to March. Peak prices of hogs shifted from August to July, and lowest prices of 'good' calves from April to July. Extremes of lamb prices usually occurred in June and October during both periods.

Wholesale prices.—The trend in wholesale prices is shown in Table 16 and in Charts 16a to 16e. There is an appreciable reduction in the ranges of steer and hog carcass prices, but the ranges of the other prices changed little. All the indexes, with the exception of veal, also showed a change in their seasonal extremes. For steers, the peak shifted from May to August and the low from November to February, and as already observed, a similar trend occurred in stockyard prices.

The peak for hogs moved from August to July and the low from December to October; for bacon the low moved from January to May. The trends in seasonal extremes for bacon and the hog carcass do not appear to be related; neither can they be related to the corresponding trend in the stockyard price (Table 15), nor with the change in seasonal extremes of the retail price of pork loins (Table 18).

Table 16.— Trends in the Seasonal Indexes of Wholesale Prices of Livestock Carcasses and Bacon for the Ten Earliest and Ten Latest Years¹

Month	Good steer carcass		Lamb carcass		Hog carcass		Bacon smoked		Veal carcass	
	1921-30	1948-57	1924-33	1948-57	1921-30	1948-54	1921-30	1948-57	1921-30	1948-57
	(per cent)									
Jan.	101	99	95	97	94	98	94	98	108	109
Feb.	99	95	96	96	97	101	96	98	109	110
Mar.	100	96	103	97	98	100	98	97	108	108
Apr.	102	96	114	100	99	98	99	96	100	98
May	106	98	114	105	100	99	97	95	92	96
June	108	103	120	123	101	106	101	100	91	96
July	104	106	114	117	105	107	105	101	90	92
Aug.	99	106	100	106	109	104	106	104	92	95
Sept.	97	104	89	92	108	101	106	108	101	96
Oct.	94	99	84	86	102	94	102	105	105	98
Nov.	92	99	82	88	95	96	101	101	103	99
Dec.	98	99	89	93	92	96	95	97	101	103
Range from high to low	16	11	38	37	17	13	12	13	19	18

¹For hogs seven years 1948-54 only.

CHART 16. – Trends in the Seasonal Indexes of Wholesale Prices

CHART 16a. – Good Steer Carcass

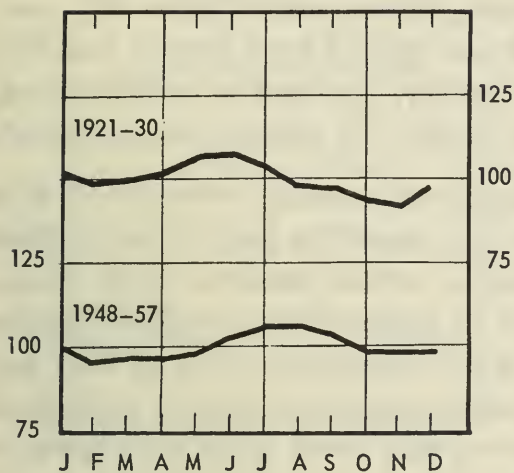


CHART 16c. – Hog Carcass

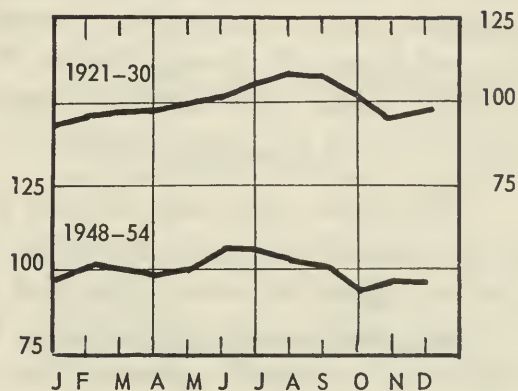


CHART 16b. – Lamb Carcass

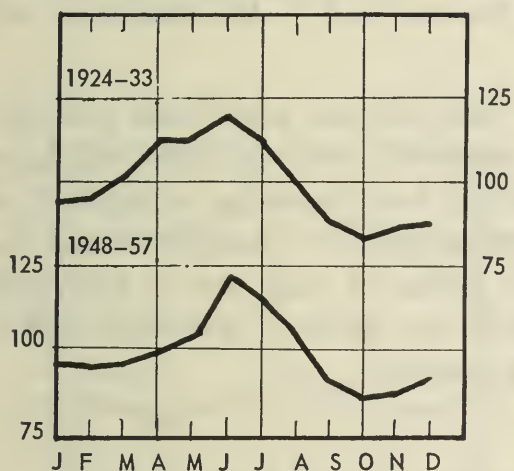


CHART 16d. – Smoked Bacon

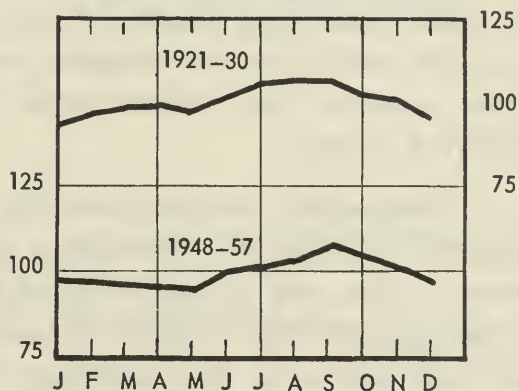
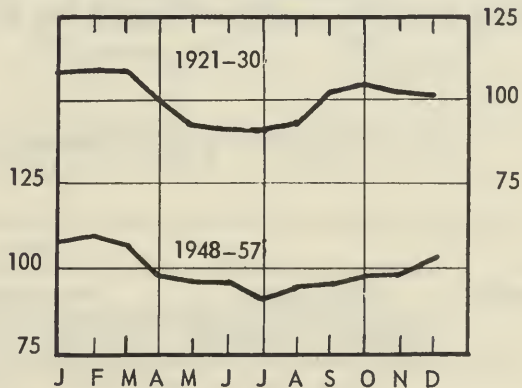


CHART 16e. – Veal Carcass



Only the prices of good steer carcass and packer hogs showed any appreciable reduction in seasonal variation between 1921-30 and 1948-57.

All prices, except that of veal carcass, showed changes in timing of seasonal extremes. Prices of good steer carcass showed the most pronounced change: the seasonal peak shifted from May to August, the low point from November to March. Similar shifts took place in prices of good steers at stockyards.

Retail prices.—Tables 17 and 18 and the corresponding charts show the trends in retail prices. Retail prices tend to be more stable than wholesale or stockyard prices. For sirloin steak, round steak, blade roast (Table 17), pork loin, and front roll of veal (Table 18), the trend was toward even greater stability as their ranges were reduced further. This, however, was not a general trend, since for lamb leg roast (Table 17) and bacon (Table 18) the ranges increased.

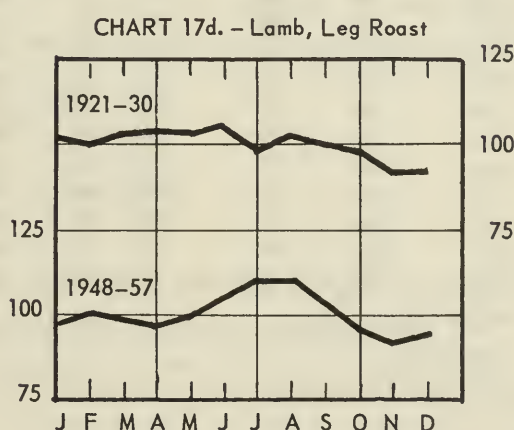
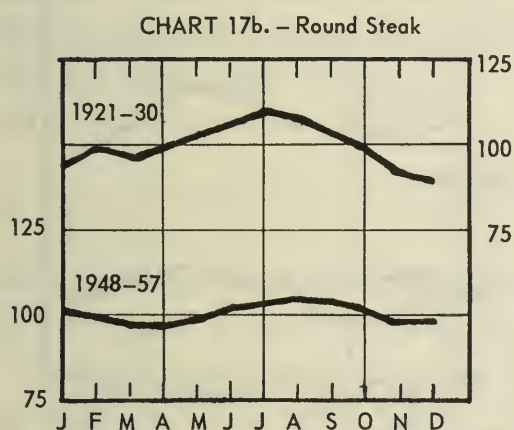
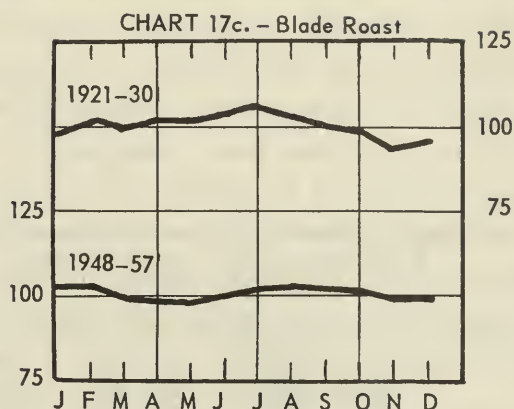
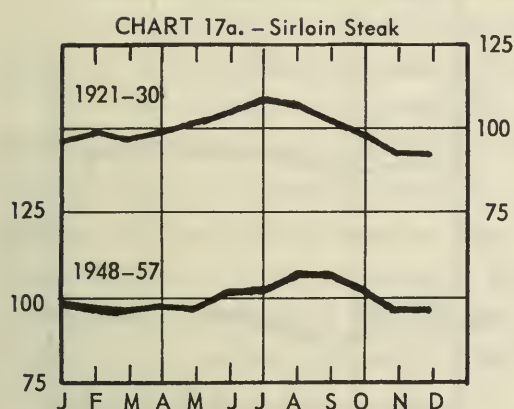
The three beef cuts showed distinct changes in seasonal extremes (Table 17). In 1921-30, the peak month for the three cuts occurred in July; it has shifted since to August for round steak and to September for sirloin steak and blade roast. The low months also occur later, by intervals of three to five months. Similar changes in seasonal extremes also occurred in the wholesale price of beef and in the stockyard price of cattle so that this trend appears to prevail throughout the entire marketing channel. Since the source of this trend does not appear to be in the production or slaughter end, it is reasonable to suggest that it arises in the consumer end, affects retail prices and passes back to the wholesale and stockyard prices.

Other retail prices, lamb leg roast in Table 17 and pork loins and veal front roll in Table 18, show some changes in seasonal extremes. The only large change is for pork loins, for which the low shifted from December to April. It is impossible with the evidence at hand to relate these trends to changes in seasonal extremes earlier in the marketing channel, as prices of only one or two retail cuts are considered. It is, of course, possible for the trend of individual cuts to differ from the combined trend for all cuts of a product.

Table 17.— Trends in Seasonal Indexes of Retail Prices of Beef and Lamb,
1921-30 to 1948-57

Month	Beef						Lamb	
	Sirloin steak		Round steak		Blade roast		leg of roast	
	1921-30	1948-57	1921-30	1948-57	1921-30	1948-57	1921-30	1948-57
	(per cent)							
Jan.	96	99	95	100	99	101	101	98
Feb.	99	98	99	99	101	101	100	100
Mar.	97	96	97	96	100	99	103	99
Apr.	99	98	99	96	101	98	104	98
May	101	97	102	98	101	98	104	99
June	105	101	106	101	103	98	105	104
July	108	103	110	103	105	101	99	110
Aug.	107	106	108	105	103	102	102	110
Sept.	103	106	104	104	100	102	100	103
Oct.	99	102	98	102	98	101	97	95
Nov.	93	97	92	98	94	99	92	91
Dec.	93	97	90	98	95	99	93	93
Range from high to low	15	10	20	9	11	4	13	19

CHART 17. - Trends in the Seasonal Indexes of Retail Prices of Beef and Lamb



Prices of the three beef cuts showed substantial reductions in seasonal range between 1921-30 and 1948-57. They also showed fairly distinct changes in timing of seasonal extremes. Price peaks for sirloin steak and blade roast now occur in September, and for round steak in August. Formerly they reached their peaks in July. The seasonal lows have also occurred later during recent years.

Table 18.— Trends in the Seasonal Indexes for the Retail Prices of Cuts of Pork and Veal, 1921-30 to 1948-57

Month	Pork				Veal	
	Bacon, smoked		Pork loin		front roll	
	1921-30	1948-57	1921-30	1948-57	1921-30	1948-57
	(per cent)					
Jan.	100	98	94	97	102	101
Feb.	98	98	95	97	106	104
Mar.	98	98	96	95	104	105
Apr.	97	97	98	93	102	102
May	97	95	99	94	96	99
June	98	98	101	103	97	98
July	101	101	105	104	96	98
Aug.	103	102	110	106	99	98
Sept.	104	105	112	108	99	98
Oct.	104	105	103	104	100	99
Nov.	101	104	96	101	100	99
Dec.	99	99	91	98	99	99
Range from high to low	7	10	21	15	10	7

Retail prices of smoked bacon showed more seasonal variation during 1921-30 than during 1948-57, while those of pork loin and veal (front roll) became more stable.

Prices of smoked bacon usually reached their seasonal extremes in May and October, during both periods.

Lowest prices of pork loin shifted from December to April, but peak prices continued to occur in September.

The seasonal extremes of veal prices also shifted a little.

CHART 18a. — Bacon, Smoked

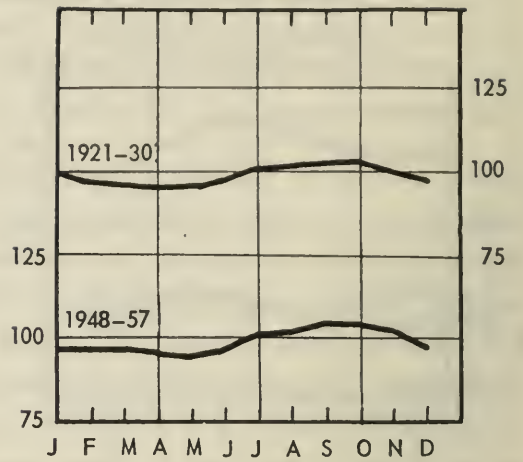


CHART 18b. — Pork Loin

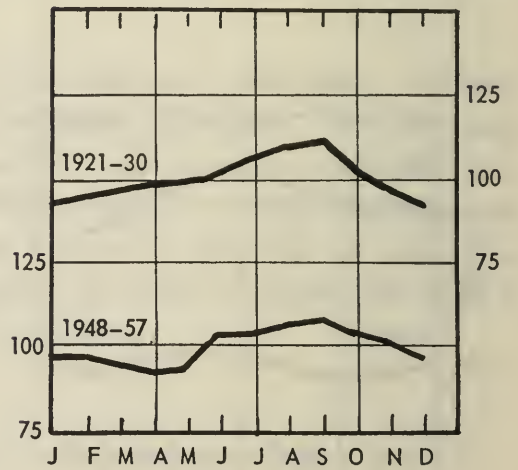
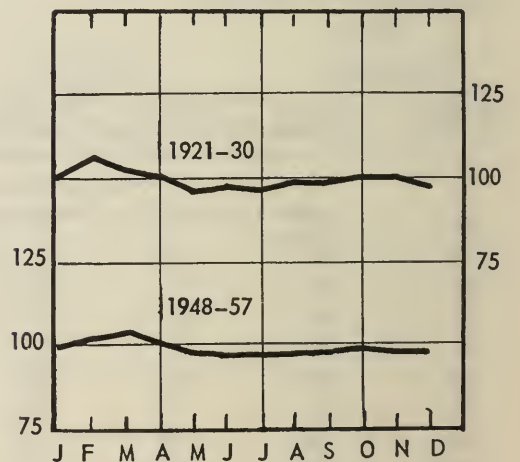


CHART 18c. — Veal Front Roll



Summary.—The trend of most of the seasonal indexes considered in this section grew less variable over the 37 year period covered. This could be traced, primarily, to production changes that affected the slaughter pattern and these were also passed on to storage stocks and prices. Secondary slaughter peaks tended to develop in hogs and calves, and appeared to result from the production of more fall litters and grass-fed calves, respectively. Conversely, the single secondary slaughter peak in cattle tended to disappear, and was replaced by several smaller secondary peaks, a change which was attributed to less feedlot feeding in the winter months, and more in other periods. There were also some changes in seasonal extremes; those for cattle and beef prices occurred most consistently throughout the entire marketing channel, and appeared to be due to changes in consumer demand. Trends in seasonal extremes for other prices were harder to trace.

APPENDIX

A measure of dispersion.—The monthly indexes are sample averages (the sample is usually the data for the period 1921-57), and are subject to variation, the standard error being a measure of this variation. The standard error is obtained from the following formula:

$$\text{standard error} = \sqrt{\frac{\sum X^2 - \frac{(\sum X)^2}{n}}{n(n-1)}}$$

where \bar{X} is the mean index for the month, X is the index for the month in a particular year and n is the number of years for which the index is observed.

The standard errors for all months and all indexes are presented in Table 19. They are to be interpreted as follows: the probability is 95 in 100 that the true index for the month lies within an interval of two standard errors on either side of the observed monthly index. For example, the observed index for November for cattle in Table 1 is 134, its standard error in Table 19 is 3 and twice the standard error is 6. Then the probability is 95 in 100 that 134 ± 6 or the interval from 128 to 140 contains the true index for the month of January. ¹By the 'true' index is the index which would result if all the items in the population were observed. In sampling, the observations are made on only a part of the population items.

Methodology.—The seasonal indexes are calculated on the assumption that the raw monthly data are the product of four types of movements, trend (T), cyclical (C), seasonal (S), and irregular (I). The raw monthly data can then be represented as $T \times C \times S \times I$.

The initial step, starting with the first month of the series is to take a 12-month moving average of the data. Two consecutive moving averages are then averaged to give a centered 12-month moving average, its value being placed opposite the seventh month from the beginning of the series, and so on for the

¹ See Croxton, E.F., and D.J. Cowden. Applied general statistics, pp. 497-98 for a discussion of reliability tests for a seasonal index.

other months. ² This step smooths out the seasonal and irregular components from the raw data and leaves only the trend and cyclical components, T x C in the moving average data. In the second step the raw monthly data are divided by the moving average data yielding the seasonal and irregular components, thus:

$$\frac{T \times C \times S \times I}{T \times C} = S \times I$$

In the third step the seasonal indexes for the same months but for different years are averaged and this removes most of the irregular component I, leaving mostly the seasonal index S.

Source of data.—All the data used for computing the indexes were obtained from the Dominion Bureau of Statistics and the Canada Department of Agriculture. Those from the Bureau were obtained from their published source material such as *Livestock and Animal Products Statistics*, *Prices and Price Indexes*, *Stocks of Meat and Lard*, and related publications. In some cases, particularly for retail prices, data were obtained from its unpublished material. Those from the Department of Agriculture are from the *Livestock Market Review*.

² See Croxton and Cowden, op. cit., pp. 471-79 for a more detailed description of this method and also for a description of some of its faults.

Table 19.— Standard errors of the Seasonal Indexes, by Months

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Inspected Slaughter												
(Table 1) Cattle	2.0	1.8	1.6	1.9	2.3	2.0	1.2	1.1	2.3	3.1	3.0	2.6
" " Sheep	2.1	2.1	2.6	2.1	1.6	2.7	2.4	3.2	5.6	6.7	6.9	3.1
" " Hogs	1.9	1.5	1.6	1.0	1.0	1.8	0.8	1.1	2.1	2.0	2.0	2.1
" " Calves	1.4	1.5	2.3	2.5	3.1	1.4	2.0	1.6	2.6	2.0	2.0	1.9
Stockyard Prices												
(Table 2) Good steers	0.9	0.9	1.0	1.0	1.1	1.1	0.9	1.1	1.0	1.0	1.1	1.0
" " Good lambs	0.7	0.8	0.9	1.0	2.3	0.9	0.9	1.2	0.9	0.8	0.9	1.0
" " B1 hog or equiv.	1.0	1.3	0.9	0.9	1.0	1.1	1.2	1.2	1.1	1.0	0.9	0.9
" " Calves, good to choice	0.9	1.2	0.8	1.4	1.6	1.1	1.0	1.0	1.0	1.1	0.9	0.9
Storage Stocks												
(Table 4) Beef	3.5	2.3	2.1	2.0	1.8	2.2	2.2	2.1	1.8	2.6	2.7	3.6
" " Lamb	2.9	2.5	2.9	2.9	5.4	2.2	2.4	1.9	2.7	3.3	4.4	3.2
" " Pork	2.1	2.0	1.6	1.6	1.5	1.8	2.2	1.8	1.5	1.3	1.6	1.8
" " Veal	3.7	3.0	2.0	1.8	1.6	2.5	2.4	1.9	1.7	2.0	2.0	2.5
Wholesale Prices												
(Table 6) Steer carcass	0.7	0.9	0.8	0.9	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.8
" " 7 Lamb carcass	0.9	0.8	1.0	1.6	2.2	2.3	1.7	1.5	1.3	1.2	1.2	1.3
" " 8 Hog carcass	0.9	1.2	1.1	1.0	1.0	1.2	1.1	1.4	1.2	1.2	1.1	1.2
" " 9 Veal carcass	1.1	1.0	0.9	1.0	1.0	1.1	1.0	0.9	1.2	1.2	0.8	0.8
" " 8 Bacon, smoked	1.2	1.2	0.9	1.0	1.1	1.1	1.0	1.2	1.4	1.1	0.9	0.9
" " 10 Wool	1.1	1.3	1.8	1.5	1.2	1.0	1.3	1.0	1.0	1.0	0.8	0.7
" " Packer hides	1.5	1.8	1.8	1.8	1.6	2.0	2.6	2.4	2.1	1.9	1.7	1.5
" " Calfskins	1.6	2.0	2.0	1.4	1.4	2.0	2.1	1.8	1.6	1.8	1.9	2.4
" " Lard	1.2	1.3	1.3	1.4	1.4	1.1	0.8	1.4	1.4	1.4	1.2	1.2
Retail Prices												
(Table 6) Sirloin steak	0.5	0.5	0.4	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.6
" " Round steak	0.6	0.4	0.5	0.5	0.6	0.7	0.8	0.6	0.5	0.5	0.7	0.8
" " Blade roast	0.7	0.6	0.5	0.7	0.6	0.6	0.8	0.6	0.6	0.6	0.6	0.7
" " 7 Lamb leg roast	0.9	0.5	0.8	0.8	0.9	1.1	1.8	1.1	1.1	0.8	0.9	0.8
" " 8 Bacon	0.8	0.6	0.7	0.6	0.7	0.7	0.7	0.7	1.1	0.8	0.8	0.7
" " 8 Fresh loin	0.8	0.9	0.8	0.8	0.8	0.6	0.7	1.1	1.1	0.8	0.9	1.0
" " 9 Veal front roll	0.6	0.6	0.6	0.5	0.5	0.5	0.7	0.5	0.5	0.6	0.5	0.5
" " 10 Lard	0.9	0.6	0.8	0.9	1.0	1.0	1.0	0.7	0.9	1.0	1.0	0.9

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